REPUBLIC OF THE PHILIPPINES

MINISTRY OF PUBLIC WORKS AND HIGHWAYS

OFFICE OF THE MINISTER

MANILA

Attachment filed in Programming Div. Planning Service

23 February 1982

MINISTRY ORDER)
NO. 17)
SERIES OF 1982)

SUBJECT: GUIDELINES, CRITERIA AND PROCEDURES FOR THE PREPARATION, PRESENTATION AND EVALUATION OF ROAD AND BRIDGE PROJECTS FOR FINANCING

N

All central and regional offices are hereby directed to comply with the enclosed guidelines, criteria and procedures for the preparation, presentation, and appraisal of road and bridge projects proposed for financing under the MPWH Infrastructure Program.

Regional offices which do not yet have the capability to undertake the required pre-feasibility or feasibility evaluation of road and bridge projects, shall, at the least, submit the basic project data called for in Attachment A for further evaluation by the central office.

Regional Offices which have undertaken pre-feasibility studies under the road restoration program, however, shall proceed with the pre-feasibility evaluation of project proposals in accordance with the guidelines and procedures set in Attachment B.

This Order takes effect immediately.

JESUS S. HIPOLITO
Minister

REPUBLIC OF THE PHILIPPINES
MINISTRY OF PUBLIC WORKS AND HIGHWAYS
OFFICE OF THE MINISTER
MANILA

GUIDELINES, CRITERIA AND PROCEDURES FOR THE PREPARATION, PRESENTATION AND EVALUATION OF ROAD AND BRIDGE PROJECTS PROPOSED FOR FUNDING UNDER THE MPWH INFRASTRUCTURE PROGRAM

A. Objective

The purpose of these guidelines, criteria and procedures is to provide a standard, simple, and objective system and methodology for the preparation, organization, presentation and evaluation of road and bridge projects which are proposed for financing under the MPWH Infrastructure Program. These are designed to facilitate the development and appraisal of such projects and to ensure that only those projects which are adequately examined and found to be feasible are considered for capital funding.

All concerned central, regional, district and city offices of the Ministry are expected to comply with this set of guidelines, criteria and procedures.

B. Project-Information

For every road/bridge project proposed for capital financing, the regional office shall submit the following sets of information to the central office:

1. Basic project input data for evaluation using the form prescribed in Attachment A. The required data are organized into four main groups, namely, general, traffic and economic, technical, and financial aspects.

2. An economic feasibility evaluation report at pre-feasibility grade for every project proposed involving an estimated capital cost of less than ₱5,000,000. The evaluation report shall generally follow the methodology and format in Attachment B. Calculations shall be presented for every homogeneous traffic section of each road/bridge project.

3. An economic feasibility evaluation report at feasibility grade for every project proposal involving an estimated capital cost of ₱5,000,000.00 or more. The evaluation report shall generally follow the methodology and format in Attachment C. Feasibility indicators shall be calculated for every homogeneous traffic section of each road/bridge project.

4. The merit rating of the project using the criteria mentioned in Section D below and the format in Attachment D.

C. Project Appraisal

Based on the aforementioned project information, the regional and central offices shall appraise each road/bridge project proposal to determine if they meet the following criteria for project acceptability.

1. The road/bridge project must be economically feasible as shown by the following indicators based on the pre-feasibility/ feasibility evaluation (Attachments B and C):

a. A First Year Benefit-Cost Ratio of at least 10.0% (for pre-feasibility grade evaluation); or

b. A Net Present Worth of at least nil at 15% discount rate, or a Benefit-Cost Ratio of at least 1 at 15% discount rate, or an Internal Rate of Return of at least 15% (for feasibility grade evaluation).

Note that the method adopted here is a modified economic benefit-cost analysis since the social equity factor, particularly income redistribution, has been imputted in line with the objective of the Government to utilize infrastructure investment as a vehicle to reduce disparities in income between geographical areas and between social groups. Thus, the conventionally calculated economic benefits are to be "weighted" to favor the poorer beneficiary areas or families. In particular, the portion of the benefits accruing to the low income groups is given the highest weight, that enjoyed by the high income group is weighted (i.e., a weight of 1), and the portion of the benefits allocated to the middle income group is given an intermediate weight. The combined weighted benefits are used in computing for the modified NPV, B/C and IRR. The weights are calculated using the average household income of the Philippines as the benchmark.

Ex. If average household income for RP = ₱6587 (base year 1975)

For Project Areas: L.I. = 4909, MI = 8076 & HI = 11,224

	RP/Income	Ratio	Weights
Low Income (LI) :	6587/4909	1.34	1.34
Middle Income (MI):	6587/8076	0.82	1.10
High Income (HI) :	6587/11,224	0.59	1.00

2. The project must be technically sound based on (at least) preliminary engineering surveys, designs, and estimates (Items 3 and 4 of Attachment A), which shows that:

a. all likely technical alternatives have been examined;

b. preliminary engineering has been carried out according to acceptable standards and practices and with a degree of detail that permits estimates of quantities to be made within plus or minus 20% of the final values; and

c. the cost of the project is as low as any other reasonably available alternative that would produce the intended results.

3. It must be included as a priority project in the Regional Development Investment Program.

Projects that fail to satisfy all of the above criteria shall be rejected or deferred. Those that fully meet the foregoing criteria shall be considered for further evaluation under Section D below.

D. Project Merit Rating

Every road/bridge project proposal that passes the criteria in Section C above shall be rated by the regional and central offices as to the extent to which the project achives economic and social development objectives.

The following criteria and rating system shall be adopted:

Objective and Weight	Indicators	Weighted Merit Points
1. Economic Feasibility- 60% weight	a. First Year Benefit-Cost Ratio (FYB/C) (for pre-feasibility evaluation)	
	Equal to 10% - - - - - - - - - -	30
	Between 10% and 30% - - -	$30 + (\frac{FYB/C-10}{20} \times 30)$
	Equal to or more than 30% - -	60
	b. Benefit-Cost Ratio (B/C) (for feasibility evaluation)	
	Equal to 1 - - - - - - - - - - -	30
	Between 1 and 3 - - - - - -	$30 + (\frac{B/C-1}{2} \times 30)$
	Equal to or more than 3 - - -	60
	NOTE: Projects with a FYB/C less than 10% or a B/C less than 1 are automatically set aside.	
2. Social Development- 25% weight	Degree of Contribution of Project to Improvement of Health/Education/Safety & Security	
	Nil or negative - - - - -	0
	Low - - - - - - - - - - - -	8
	Medium - - - - - - - - - -	17
	High - - - - - - - - - - -	25
3. Induced Employment 15% weight	Degree of Employment Generating Capacity	
	Nil - - - - - - - - - - - -	0
	Low - - - - - - - - - - - -	5
	Medium - - - - - - - - - -	10
	High - - - - - - - - - - -	15

The total possible maximum number of weighted merit points that a project may obtain is 100.

The total weighted merit points registered by each project are calculated and the projects are ranked according to their merit points. This ranking will indicate the order of priorities of the projects.

BASIC DATA REQUIREMENT FOR PROPOSED ROAD/BRIDGE PROJECT

1. GENERAL

1.1 Name of Project : _____

1.2 Location :

Region _____ Province _____

City/Municipality _____ Barangay _____

Attach map indicating general location of proposed project preferably in an updated copy of the official road map of the Province/District.

1.3 Administrative Classification of Project (Please check) :

☐ National ☐ Provincial

☐ City/Municipal ☐ Barangay

☐ Combination/Other (Specify) _____

1.4 Nature of Project (Please check)

☐ Existing ☐ New Link

☐ Combination (Specify) _____

1.5 Extent of Project :

Total Length: _____ kms./L. M.

Section Limits: Km. Sta.: _____ to Km. Sta. _____

Aggregate length of existing sections: _____ kms./L. M.

Aggregate length of new sections: _____ kms./L. M.

Aggregate length of exempted sections: _____ kms./L. M.

Net Length of Project: _____ kms./L. M.

1.6 Project Status (Please check and indicate corresponding applicable dates) :

	Not Started	Underway	Completed
Pre-feasibility study	_____	_____	_____
Feasibility study	_____	_____	_____
Detailed engineering	_____	_____	_____
Construction	_____	_____	_____

Remarks: _____

_____

1.7 Inclusion of Project in Regional Development Investment Program:

[ ] Yes [ ] No

2. ECONOMIC AND TRAFFIC

2.1 Influence Area (Consider 5 kms. each side of the road except where there are natural barriers. Correlatively, where there is a parallel road less than 10 kms. from the proposed project, assume midway as extent of influence area.)

2.1.1 Population Served

Census Year _____ Population _____

2.1.2 Average Per Capita Income of Household Served:
₱ _____/annum Year _____

Source of data: _____

2.1.3 Land Use

Area available to Agriculture _____ has.

Details of Utilization (ha.)

Crop Type	Cultivated	Potential	Total
Rice			
Corn			
Coconut			
Abaca			
Sugar Cane			
Others			
T O T A L			

Area available to Forestry _____ has.

Classification	Utilized	Potential	Total
Timberland			
Forest Reserve			
T O T A L			

Area available to Fischer/Aquatic Resources

Classification	Utilized	Potential	Total
Inland			

Marine Resources (describe extent) _____

Area available to Mineral Resources _____ has.

Classification	Utilized	Potential	Total
Mettalic			
Non-Metallic			
T O T A L			

Area available to other Industries/Resources (specify and tabulate)

2.1.4 Production Statistics (Last five years) - (Tons)
- Indicate sources of data -

Agriculture

Crop \ Year	1977	1978	1979	1980	1981
Rice					
Corn					
Coconut					
Abaca					
Sugar Cane					
(Others)					
T O T A L					

Forest Resources

Type \ Year	1977	1978	1979	1980	1981
Log (cu. m.)					
Lumber (bd.ft.)					
(Others)					

Fishery/Aquatic Resources

Type \ Year	1977	1978	1979	1980	1981
Inland					
Marine					
(Others)					
T O T A L					

Mineral Resources

T O T A L

Year	Metallic		Non-Mettalic	
	Prod.	Est. Value	Prod.	Est. Value
1977				
1978				
1979				
1980				
1981				

(Specify also significant production of other natural resources or industries in the influence area)

Present in a map (preferably in 1:50,000 scale) the general influence area of the proposed project indicating land use and location of production areas.

2.2 Traffic ☐ AADT ☐ ADT ☐ Other (specify)

Section \ Year	1977	1978	1979	1980	1981
(1) Km ____ to ____					
(2) Km ____ to ____					
(3) Km ____ to ____					
T O T A L					

2.2.1 Present Traffic (1981)

Type \ Section	(1)	(2)	(3)		Total
Car/Van					
Jeepney					
Bus					
Truck					
T O T A L					

(Indicate data source, e.g.: 1979 figures for section (1) were taken from sta. 2701 of the Nationwide Traffic Counting Program; or 1981 figures for section (3) were derived from a special classified traffic count survey conducted in August 7-14 at km. sta. ____ for 16 hours/day ; or figures are estimated only)

2.2.2 Potential Traffic Diverted: year - (1982)

2.2.2.1 From Other Roads[1/]

(Name of road from which diversion is expected)

Type \ Section[2/]	(1)	(2)	(3)	Total
Car/Van				
Jeepney				
Bus				
Truck				
T O T A L				

1/ If there are several roads from which traffic diversion is expected to the proposed project, present tabulations separately.

2/ Refers to the traffic sections on the proposed project.

Remarks (Explain the basis and assumptions for the estimates and show in a map the basic network):

_____

_____

_____

_____

2.2.2.2 From Other Modes

Type Section	(1)	(2)	(3)	Total
a) Sea/Water Transport				
passenger (no.)				
cargo (ton)				
b) Rail				
passenger (no.)				
cargo (ton)				
c) Other modes (specify)				

Remarks (Explain the basis and assumptions for the estimates):

_____

_____

_____

_____

3. TECHNICAL

3.1 Present Condition

3.1.1 Existing Road Sections

(Undertake an actual inventory using the prescribed format; refer to Annex 1 for instructions)

3.1.2 New Road Sections

General Terrain Conditions (Please check)

☐ flat ☐ rolling ☐ mountainous

3.1.3 For Existing Bridges/Structures

Type _____

Condition: ☐ good ☐ fair ☐ bad ☐ very bad

Location _____

Year constructed _____

Major hydrological problems: ☐ Yes ☐ No

ROAD INVENTORY FORMAT

REGION : _____

NAME OF ROAD _____ PROVINCE: _____

FROM: _____ TO: _____ LENGTH: _____ PAGE: _____ of _____

STATIONING	TERRAIN	CROSS SECTION		TYPE OF SURFACE AND CONDITION					SHOULDER		ALIGNMENT				DRAINAGE		STRUCTURES				REMARKS
											HORIZONTAL		VERTICAL								
											Sharp Curves		Grades								
		Carriageway m	Shoulder m	PCC	AC	BST	G	E	Type	Condition	25-40 m	<25 m	%	Length	Side Drains	Missing Culverts	Types	Width m	Length m	Condition	

LEGEND:

TERRAIN : Flat , Rolling , Mountainous

SURFACE : Type : PCC = Cement Concrete Pavement
AC = Asphalt Concrete
BST = Bituminous Surface
G = Gravel
E = Earth

Condition : Good , Fair , Bad , Very Bad

ALIGNMENT : Sharp Curves = Number of (IIII) curves by radius group
Grades in % = 3-5 , 5-7 , 7-9 , 9-11, etc

DRAINAGE Side Drains = Good , Fair , Bad , None
Missing Culverts = Number of (IIII) culverts

STRUCTURES : Type = Steel / Concrete Bridge
Bailey Bridge
Timber Bridge
Concrete Spillway
Ford

Condition = Good , Fair , Bad
Length in meters
Width in meters

3.2 Alternative Technical Solutions (present at least 2 alternatives)

In considering alternative technical solutions of road projects, use the following as a general guide:

AADT (in vehicles) Thresholds in Opening Year

National Roads:

AADT	≤200	201-350	351-550	551-750	751-1500	1501-15000
Carriageway Width (M)	6.0	6.0	6.1	6.1	6.7	7.0
Shoulder Width 2x(m)	-	1.0	2.0	2.0	2.5	2.5
Pavement Type	GR	GR	DBST	AC	AC	AC/CC

Barangay Roads:

AADT	≤50	51-150	150-200
Carriageway Width (M)	4.5	5.0	5.0
Shoulder	-	-	0.5
Pavement	GR	GR	GR

3.2.1 Existing Sections

Section Number : _____

Limits : Km. _____ to _____

Length : _____ kms.

Nature of Work (Please check):

☐ Improvement ☐ Rehabilit tion ☐ Reconstruction

Alternative Impr vement Level I

Road Standards :

Carriageway width : _____ (m)

Shoulder width : 2 x _____ (m)

Pavement Type _____ (Specify thickness for AC & PCC)

Bridge Standards:

Type of Structure _____ (Specify and/or describe)

Carriageway width : _____ m

Engineering/Design Requirements (Please check)

☐ Standard ☐ Special

Alternative Improvement Level II

Road Standards :

Carriageway width : _____ m

Shoulder width : 2 x _____ m

Pavement Type _____ (Specify thickness for AC & PCC)

Bridge Standards:

Type of Structure _____ (Specify and/or describe)

Carriageway width : _____ m

Engineering/Design Requirements (Please check)

☐ Standard ☐ Special

Section Number : _____ (and so on)

NOTE: Indicate similar information for as many sections as necessary which should not be less than the number of traffic sections indicated under traffic data.

3.2.2 New Sections

Section Number : _____

Limits : Km. _____ to _____

Length : _____ kms.

Nature of Work (Please check):

☐ Improvement ☐ Rehabilitation ☐ Reconstruction

Alternative Improvement Level I

Road Standards :

Carriageway width : _____ (m)

Shoulder width : 2 x _____ (m)

Pavement Type _____ (Specify thickness for AC & PCC)

Bridge Standards:

Type of Structure _____ (Specify and/or describe)

Carriageway width : _____ m

Engineering/Design Requirements (Please check)

☐ Standard ☐ Special

Alternative Improvement Level II

Road Standards :

Carriageway width : _____ m

Shoulder width : 2 x _____ m

Pavement Type _____ (Specify thickness for AC & PCC)

Bridge Standards:

Type of Structure _____ (Specify and/or describe)

Carriageway width : _____ m

Engineering/Design Requirements (Please check)

☐ Standard ☐ Special

Section Number : _____ (and so on)

NOTE: Indicate similar information for as many sections as necessary which should not be less than the number of traffic sections indicated under traffic data.

3.2.3 Extent of Engineering Studies (Please check)

Topographic Surveys

☐ Plan-Profile Date: _____

☐ Cross Section Date: _____

☐ Parcellary Date: _____

☐ Others (Specify) Date: _____

1. FINANCIAL ASPECTS

4.1 Project Cost Estimates (₱1000) Base Year _____

Item	Section 1		Section 2		Section 3... and so on		Total	
	Improvement Level I	Improvement Level II	Improvement Level I	Improvement Level II	Improvement Level I	Improvement Level II	Improvement Level I	Improvement Level II
1. Earthwork								
2. Pavement								
3. Drainage								
4. Bridges								
5. Miscellaneous								
6. Sub-Total								
7. Contingency (__%) (10% of 6)								
8. Engineering (4% of 6 + 7)								
9. Supervision (5% of 6 + 7)								
10. R O W								
TOTAL COST								

4.2 Project Implementation Schedule

Work Item \ Year	19___	19___	19___	19___
Engineering				
ROW Acquisition				
Construction				
Const. Supervision				

(Indicate with a "bar" the corresponding period for each work item)

4.3 Estimated Cash Flow (₱1000)

Work Item \ Year	19___	19___	19___	Total
Engineering				
ROW Acquisition				
Construction				
Supervision				
Total				

INSTRUCTIONS FOR ROAD INVENTORY

Below are the definitions of various surface condition ratings for existing road sections:

Good : No potholes or rutting or corrugation. Less than 5 potholes per 1000 meters. Cracking which do not affect driving condition maybe ignored.

Fair : More than 5 but less than 20 potholes per 1000 meters and/or slight cracking and/or rutting and/or corrugated (less than 50% of the section length). Passenger car speed will exceed 40 km./hr.

Bad : More than 20 potholes per 1000 meters and/or slightly rutted and/or corrugated (more than 50% of the section length) and/or heavily rutted and/or corrugated over approximately the entire length. Pavements, if any, starting to break up. Maximum comfortable travel speed (car) 40 km./hr.

Very Bad: Pavement breaking up and gravel surface deteriorated into numerous potholes. Just passable for cars. Maximum comfortable travel speed (car) is about 30 km./hr.

DEFINITION OF CONDITION RATINGS BASED ON ACTUAL CONDITION OF BRIDGES

Good : Bridges that have been carrying normal traffic for a longer length of time, no signs of distress/deterioration and their load carrying capacity is considered adequate, no work or improvement to be done.

Fair : Bridges that show signs of deterioration on the superstructure and substructure such as spalling on concrete deck, light cracks on concrete surface, rusty steel trusses, scouring on piers, damage slope protections.

Bad : Bridges that show signs of heavy deterioration on the structure such as showing heavy longitudinal cracks/random cracks, splitting of concrete at tension reinforcement level, heavy spalling of concrete surface; exposed rusty reinforcing bars at girders and bridges that are extensively damaged and structurally unsafe for vehicular traffic.

Very Bad : Bridge incapable of carrying future traffic, structurally and hydraulically deficient, and possible to collapse.

GUIDELINES ON CALCULATION PROCEDURES FOR PRE-FEASIBILITY EVALUATION OF ROAD PROJECTS

A. Actual Vehicle Operating and Passenger Time Costs (AVOPTC) (Excluding Taxes and Custom Duties) Pesos Per Km.

Pavement Type/Condition		Running Cost	Fixed Cost	Time Cost	Total
Paved, Very Bad	Cars/Vans	1.838	0.054	0.200	2.092
	Jeepneys	0.941	0.204	0.302	1.447
	Buses	4.480	0.612	1.516	6.608
	Trucks	4.693	0.488	-	5.181
Paved, Bad	Cars/Vans	1.609	0.040	0.150	1.799
	Jeepneys	0.823	0.153	0.226	1.202
	Buses	3.773	0.459	1.137	5.369
	Trucks	3.952	0.366	-	4.318
Paved, Fair	Cars/Vans	1.379	0.027	0.100	1.506
	Jeepneys	0.706	0.102	0.151	0.959
	Buses	3.065	0.306	0.910	4.281
	Trucks	3.211	0.244	-	3.455
Paved, Good	Cars/Vans	1.149	0.023	0.086	1.258
	Jeepneys	0.588	0.088	0.130	0.806
	Buses	2.358	0.367	0.758	3.483
	Trucks	2.470	0.293	-	2.763
Gravel, Very Bad	Cars/Vans	2.183	0.054	0.200	2.437
	Jeepneys	1.117	0.204	0.302	1.623
	Buses	5.423	0.612	1.516	7.551
	Trucks	5.68	0.488	-	6.169
Gravel, Bad	Cars/Vans	1.838	0.040	0.150	2.028
	Jeepneys	0.941	0.153	0.226	1.320
	Buses	4.480	0.612	1.516	6.608
	Trucks	4.693	0.488	-	5.181
Gravel, Fair	Cars/Vans	1.494	0.032	0.120	1.646
	Jeepneys	0.764	0.122	0.181	1.067
	Buses	3.537	0.459	1.137	5.133
	Trucks	3.705	0.366	-	4.071

Pavement Type/Condition		Running Cost	Fixed Cost	Time Cost	Total
Gravel, Good	Cars	1.321	0.027	0.100	1.448
	Jeepneys	0.676	0.102	0.151	0.929
	Buses	2.948	0.306	0.910	4.164
	Trucks	3.088	0.244	-	3.332

B. Present Traffic (1981) AADT
(Refer to Subsection 2.2.1)

Example:

Vehicle Type \ Section	1	2
Car /Van	50	300
Jeepney	120	110
Bus	30	80
Truck	60	130
Total	260	620

C. Road Inventory Statistics - Existing Road or "Without Project" Case
(Refer to Subsection 3.1.1)

Section 1 - 18.4 Km. consisting of the following:

5.6 km. Very Bad Gravel 5.5 m. carriageway
4.8 km. Fair Gravel 5.0 m. carriageway
3.5 km. Bad Asphalt 6.0 m. carriageway
4.5 km. Bad Gravel 6.7 m. carriageway

Section 2 - 12.7 Km. consisting of the following:

7.4 km. Bad Gravel 6.0 m. carriageway
5.3 km. Very Bad Asphalt 6.1 m. carriageway

D. Proposed Improvement Level or "With Project" Case
(Refer to Section 3.2)

Section 1 - 6.0 m. Gravel + 2 x 1.0 m. gravel shoulders

Section 2 - 6.1 m. Asphalt Concrete (AC) + 2 x 2.0 m. gravel shoulders

E. Summary of Financial Improvement Costs (1000₱)

Work Item	Section 1	Section 2
1. Direct Construction Cost	7360	8486
2. Detailed Engineering (4% of 1)	294	339
3. Construction Supervision (5% of 1)	368	424
4. Total Project Cost (1 + 2 + 3)	8022	9249

F. Calculate First Year Benefit/Cost Ratio (FYB/C)

F-1 Traffic Costs

Use the formula given below:

Traffic Costs (TC) = AADT (VT) x .365 x AVOPTC x L (Km.)

where TC = Traffic Cost in 1000₱

AADT (VT) = Annual Average Daily Traffic by Vehicle Type

.365 = Factor to convert TC into 1 year total in 1000₱

AVOPTC = Actual Vehicle Operating and Passenger Time Cost

L = Length in km. of road subsection

a) "Without Project" Case - This corresponds to the present situation and existing road condition

Road Section 1

Cars	TC = 50 x .365 x 2.437 x 5.6	=	249
	TC = 50 x .365 x 1.646 x 4.8	=	144
	TC = 50 x .365 x 1.799 x 3.5	=	115
	TC = 50 x .365 x 2.028 x 4.5	=	166
	Total	=	674
Jeepneys	TC = 120 x .365 x 1.623 x 5.6	=	398
	TC = 120 x .365 x 1.067 x 4.8	=	224
	TC = 120 x .365 x 1.202 x 3.5	=	184
	TC = 120 x .365 x 1.320 x 4.5	=	260
	Total	=	1066
Buses	TC = 30 x .365 x 7.551 x 5.6	=	463
	TC = 30 x .365 x 5.133 x 4.8	=	270
	TC = 30 x .365 x 5.369 x 3.5	=	206
	TC = 30 x .365 x 6.608 x 4.5	=	326
	Total	=	1265

Trucks	TC = 60 x .365 x 6.169 x 5.6	= 756
	TC = 60 x .365 x 4.071 x 4.8	= 428
	TC = 60 x .365 x 4.318 x 3.5	= 331
	TC = 60 x .365 x 5.181 x 4.5	= 510
	Total	= 2025
	TC (All Vehicles)	5030

b) "With Project" Case - The costs in this case refer to the traffic costs after improvement

Road Section 1

Cars	TC = 50 x .365 x 1.448 x 18.4	= 486
Jeepneys	TC = 120 x .365 x 0.929 x 18.4	= 749
Buses	TC = 30 x .365 x 4.164 x 18.4	= 839
Trucks	TC = 60 x .365 x 3.332 x 18.4	= 1343
	TOTAL (All Vehicles)	= 3417

c) "Without Project" Case

Road Section 2

Cars	TC = 300 x .365 x 2.028 x 7.4	= 1643
	TC = 300 x .365 x 2.092 x 5.3	= 1214
	Total	= 2857
Jeepneys	TC = 110 x .365 x 1.320 x 7.4	= 392
	TC = 110 x .365 x 1.447 x 5.3	= 308
	Total	= 700
Buses	TC = 80 x .365 x 6.608 x 7.4	= 1428
	TC = 80 x .365 x 6.608 x 5.3	= 1023
	Total	= 2451
Trucks	TC = 130 x .365 x 5.181 x 7.4	= 1819
	TC = 130 x .365 x 5.181 x 5.3	= 1303
	Total	= 3122
	TC (All Vehicles)	= 9130

d) "With Project" Case

Road Section 2

Cars	TC = 300 x .365 x 1.258 x 12.7	= 1749
Jeepneys	TC = 110 x .365 x 0.806 x 12.7	= 411
Buses	TC = 80 x .365 x 3.483 x 12.7	= 1292
Trucks	TC = 130 x .365 x 2.763 x 12.7	= 1665
	TC (All Vehicles)	= 5117

F-2 Traffic Cost Benefits and First Year Benefit/Cost (%)

The first year benefit is calculated as the total traffic costs based on the existing or "Without Project" case less the total traffic costs using the "With Project" case; the first year corresponds to the year in which the road is fully opened to vehicular traffic.

The formula for the First Year Benefit/Cost is given below:

$$FYB/C = \frac{\text{First Year Benefit}}{\text{Financial Project Cost} \times .86} \times 100 = \_\_\_\_\%$$

Road Section 1

$$FYB/C = \frac{5030 - 3417}{.86 \times 8022} \times 100 = 23.4\%$$

Road Section 2

$$FYB/C = \frac{9130 - 5117}{.86 \times 9249} \times 100 = 56.6\%$$

The factor 0.86 is applied to convert the financial improvement costs into "economic" costs, the average total taxes plus custom duties being estimated at 14% of the financial costs.

The foregoing procedures are based entirely on economic efficiency considerations. As required, however, by this Ministry Order (Please refer to Item C, Para. 1) on income redistribution benefit, to be calculated as a percentage of the total First Year Benefits should be added.

Example

If our sample road project is serving predominantly low income areas, the applicable factor is 1.34 and the calculation would thus be as follows:

Road Section 1

$$\text{Revised } FYB/C = \frac{1.34(5030 - 3417)}{.86 \times 8022} \times 100 = 31.3\%$$

Road Section 2

$$\text{Revised } FYB/C = \frac{1.34(9130 - 5117)}{.86 \times 9249} \times 100 = 67.6\%$$

F-3 Results of Pre-Feasibility Evaluation

Section No.	FYB/C (%)	Revised FYB/C (%)

GUIDELINES ON CALCULATION PROCEDURES FOR ECONOMIC FEASIBILITY EVALUATION OF ROAD PROJECTS

A. Vehicle Operating and Passenger Time Cost

The Planning Service, MPWH, has already derived the total vehicle Operating and Passenger Time costs per km. for each vehicle type using June 1981 prices and included in these guidelines for use in the benefit calculations for existing sections.

Derived Vehicle Operating and Passenger Time Costs
Pesos Per Km. (June 1981 Prices)

Pavement Type/Condition		Running Cost	Fixed Cost	Time Cost	Total
Paved, Very Bad	Cars/Vans	1.838	0.054	0.200	2.092
	Jeepneys	0.941	0.204	0.302	1.447
	Buses	4.480	0.612	1.516	6.608
	Trucks	4.693	0.488	-	5.181
Paved, Bad	Cars/Vans	1.609	0.040	0.150	1.799
	Jeepneys	0.823	0.153	0.226	1.202
	Buses	3.773	0.459	1.137	5.369
	Trucks	3.952	0.366	-	4.318
Paved, Fair	Cars/Vans	1.379	0.027	0.100	1.506
	Jeepneys	0.706	0.102	0.151	0.959
	Buses	3.065	0.306	0.910	4.281
	Trucks	3.211	0.244	-	3.455
Paved, Good	Cars/Vans	1.149	0.023	0.086	1.258
	Jeepneys	0.588	0.088	0.130	0.806
	Buses	2.358	0.367	0.758	3.483
	Trucks	2.470	0.293	-	2.763
Gravel, Very BAd	Cars/VAns	2.183	0.054	0.200	2.437
	Jeepneys	1.117	0.204	0.302	1.623
	Buses	5.423	0.612	1.516	7.551
	Trucks	5.681	0.488	-	6.169
Gravel, Bad	Cars/Vans	1.838	0.040	0.150	2.028
	Jeepneys	0.941	0.153	0.226	1.320
	Buses	4.480	0.612	1.516	6.608
	Trucks	4.693	0.488	-	5.181

Pavement Type/Condition		Running Cost	Fixed Cost	Time Cost	Total
Gravel, Fair	Cars/Vans	1.494	0.032	0.120	1.646
	Jeepneys	0.764	0.122	0.181	1.067
	Buses	3.537	0.459	1.137	5.133
	Trucks	3.705	0.366	-	4.071
Gravel, Good	Cars	1.321	0.027	0.100	1.448
	Jeepneys	0.676	0.102	0.151	0.929
	Buses	2.948	0.306	0.910	4.164
	Trucks	3.088	0.244	-	3.332

The bases for the calculations are the observed traffic characteristics, desirable vehicle operating speeds for various surface types and conditions, forecast vehicle composition, the Basic Vehicle Operating Costs and dl factors for surface types and conditions as shown below:

Average Number of Passengers

	Trip Purpose			
	In Work	To/From Work	Others	Total
Cars[1)]	2.0	2.0	2.2	2.1
Vans				1.5
Jeepneys				10.0
Buses				40.0

1) Incl. driver

Trip Purpose Distribution

Cars	15%	37%	48%	100.0%
Buses and Jeepneys	3%	59%	38%	100.0%

Forecast Vehicle Composition

Cars/Vans		100%
	Heavy Car	1%
	Light Car	22%
	Bantam CAr	50%
	Jeep	12%
	Van	15%
Jeepneys		100%
	"Fiera"	100%
Buses		100%
	Small Bus (Diesel)	30%
	Large Bus (Diesel)	70%
Trucks		100%
	Small Truck (Gas)	10%
	Medium Truck (Diesel)	30%
	Heavy Truck (Diesel)	60%

Vehicle Operating Speeds on Different Surface Types and Conditions (KPH)

Surface Type/Condition	Vehicle Types			
	Cars/Vans	Jeepneys	Buses	Trucks
Paved[1], Very Bad	30	30	30	30
Paved, Bad	40	40	40	40
Paved, Fair	60	60	50	50
Paved, Good	70	70	60	60
Gravel, Very Bad	30	30	30	30
Gravel, Bad	40	40	30	30
Gravel, Fair	50	50	40	40
Gravel, Good	60	60	50	50

1) Surface Dressed, BST, Bit. Macadam, AC and PCC

Basic Vehicle Operating Costs
June 1981 Prices

	Running Costs (₱/km.)	Fixed Costs (₱/Min.)	Time Costs (₱/Min.)
Cars/Vans	1.149	0.027	0.100
Jeepneys	0.588	0.102	0.151
Buses	2.358	0.306	0.758
Trucks	2.470	0.244	-

In these guidelines only the dl values for surface type and condition were applied in the calculation of the derived running costs component.

dl Values/Km.

Surface Type	Condition	Light Vehicles[1)]	Heavy Vehicles[2)]
Paved	Very Bad	0.60	0.90
Paved	Bad	0.40	0.60
Paved	Fair	0.20	0.30
Paved	Good	0.00	0.00
Gravel	Very Bad	0.90	1.30
Gravel	Bad	0.60	0.90
Gravel	Fair	0.30	0.50
Gravel	Good	0.15	0.25

1) Cars/Vans, Jeepneys

2) Buses, Trucks

B Present and Future Traffic

B-1 Normal Traffic Growth Rates

The traffic growth rates maybe estimated on the basis of forecast population and per capita income growth and transport demand-income elasticity coefficients and with the use of the formula below.

$$TGR\ (\%) = \left[\left(\frac{I \times E}{100} + 1\right) CP - 1\right] 100$$

where: TGR is the traffic growth rate, in percent, per annum by vehicle type
I is the projected growth rate of per capita income in constant prices
E is the transport demand/income elasticity, and
CP is the compound population growth rate per annum

Growth rates should be estimated separately for Cars/Vans, Jeepneys, Buses and Trucks throughout the 20-year economic project life, but in 4 five-year periods. Similarly, the growth rates from the base year to the expected opening should be estimated. The values of E as derived in previous feasibility exercises are: 1.4 for Jeepneys/ Buses and 1.8 for Cars. These values maybe used directly. Information on population projections (use the medium assumptions) maybe obtained from the NEDA/NCSO regional offices. Forecasts of per capita income are also available at NEDA.

SAMPLE CALCULATION (Using 1980 as base year and 1984 as opening year)

Data from NEDA/NCSO

Forecast Population Growth Rate:		Per Capita Income Growth Rate in Constant Prices	
1980-1984	- 2.8% p.a.	1980-1984	- 3.0% p.a.
1984-1989	- 2.6% p.a.	1984-1989	- 3.4% p.a.
1989-1994	- 2.3% p.a.	1989-1994	- 4.0% p.a.
1994-1999	- 2.0% p.a.	1994-1999	- 3.8% p.a.
1999-2003	- 1.8 p.a.	1999-2003	- 3.6% p.a.

Using the data and traffic growth formula given above, the growth rates should be calculated as follows:

Cars/Vans

$$(1981\text{-}1984)\ TGR = \left[\left(\frac{3.0 \times 1.8}{100} + 1\right)\ 1.028 - 1\right]\ 100 = 8.35\%$$

$$(1984\text{-}1989)\ TGR = \left[\left(\frac{3.4 \times 1.8}{100} + 1\right)\ 1.026 - 1\right]\ 100 = 8.88\%$$

$$(1989\text{-}1994)\ TGR = \left[\left(\frac{4.0 \times 1.8}{100} + 1\right)\ 1.023 - 1\right]\ 100 = 9.66\%$$

$$(1994\text{-}1999)\ TGR = \left[\left(\frac{3.8 \times 1.8}{100} + 1\right)\ 1.020 - 1\right]\ 100 = 8.98\%$$

$$(1999\text{-}2003)\ TGR = \left[\left(\frac{3.6 \times 1.8}{100} + 1\right)\ 1.018 - 1\right]\ 100 = 8.40\%$$

Jeepneys and Buses

$$(1981\text{-}1984)\ TGR = \left[\left(\frac{3.0 \times 1.4}{100} + 1\right)\ 1.028 - 1\right]\ 100 = 7.12\%$$

$$(1984\text{-}1989)\ TGR = \left[\left(\frac{3.4 \times 1.4}{100} + 1\right)\ 1.026 - 1\right]\ 100 = 7.48\%$$

$$(1989\text{-}1994)\ TGR = \left[\left(\frac{4.0 \times 1.4}{100} + 1\right)\ 1.023 - 1\right]\ 100 = 8.03\%$$

$$(1994\text{-}1999)\ TGR = \left[\left(\frac{3.8 \times 1.4}{100} + 1\right)\ 1.020 - 1\right]\ 100 = 7.43\%$$

$$(1999\text{-}2003)\ TGR = \left[\left(\frac{3.6 \times 1.4}{100} + 1\right)\ 1.018 - 1\right]\ 100 = 6.93\%$$

Truck traffic growth rates maybe assumed at 6.00% per annum throughout the 20 year period, this value being approximately equal to the forecast growth of the Gross Domestic Product (GDP).

Tabulate all the growth rates thus derived.

Normal Traffic Growth Rates
(1980-2003, Percent Per Annum)

Vehicle Type	1980-84	1984-89	1989-94	1994-99	1999-03
Cars/Vans	8.35	8.88	9.66	8.98	8.40
Jeepneys	7.12	7.48	8.03	7.43	6.93
Buses	7.12	7.48	8.03	7.43	6.93
Trucks	6.00	6.00	6.00	6.00	6.00

B-2 Projected Traffic

Using the corresponding growth rates above on the 1981 traffic (See Section 2.2.1), the future traffic should then be projected and tabulated in the following manner.

Vehicle Type	Traffic Survey 1981[1)]	Forecast Traffic 1984	1989	1994	1999	2003
Cars/Vans	240	305	470	745	1145	1715
Jeepneys	90	110	160	235	340	445
Buses	70	85	120	175	250	325
Trucks	110	130	175	220	295	375
TOTAL	510	630	925	1375	2030	2860

1) The 1981 traffic figures have been assumed for illustrative purposes only.

C Actual Traffic Costs (ATC)

Estimate the vehicle operating and passenger time costs, by road section, for the existing road under the present conditions as gathered through the inventory (See Section 3.1.1) and for each alternative improvement level (See Section 3.2.1). Use the total costs for each vehicle type in Section 5.1 and the projected traffic in Section 5.2.2. For facility in calculation, compute the actual traffic costs for the years 1984, 1989, 1994, 1999 and 2003 only and interpolate exponentially the in-between values. This is demonstrated in the following sample calculations, using road Section 1 in 2.2.1

Use the formula shown below:

ATC (₱1000) = AADT (VT) x .365 x VOPTC x L

where ATC = Actual Traffic Cost, in thousand pesos, for the vehicle type used for the whole year

AADT (VT) = Annual average daily traffic by vehicle type

.365 = Factor to convert daily ATC to 1 year total and in thousand pesos

VOPTC = Vehicle Operating and Passenger Time Costs, pesos per km.

L = Physical length of road section or subsection

Road Inventory Information:

Total Length of Section = 10.6 km.

4.2 km. is 5.5 m., very bad gravel, w/o shoulders

6.4 km. is 6.0 m., bad surface dressed, w/ 0.5 m. shoulders

Proposed Improvement Alternative

Impr. Level 1 : 10.6 km. - 6.1 m. AC + 2 x 2.0 m Gr. Shoulders

Calculations:

Existing Road (1984) (₱1000)

Cars/Vans	ATC = 305 x .365 x 2.437 x 4.2	= 1139
	ATC = 305 x .365 x 1.799 x 6.4	= 1282
Jeepneys	ATC = 110 x .365 x 1.623 x 4.2	= 274
	ATC = 110 x .365 x 1.202 x 6.4	= 309
Buses	ATC = 85 x .365 x 7.551 x 4.2	= 984
	ATC = 85 x .365 x 5.369 x 6.4	= 1066
Trucks	ATC = 130 x .365 x 6.169 x 4.2	= 1229
	ATC = 130 x .365 x 4.318 x 6.4	= 1311
	Total ATC	= 7594

Existing Road (1989) (₱1000)

Cars/Vans	ATC = 470 x .365 x 2.437 x 4.2	= 1756
	ATC = 470 x .365 x 1.799 x 6.4	= 1975
Jeepneys	ATC = 160 x .365 x 1.623 x 4.2	= 398
	ATC = 160 x .365 x 1.202 x 6.4	= 449
Buses	ATC = 120 x .365 x 7.551 x 4.2	= 1389
	ATC = 120 x .365 x 5.369 x 6.4	= 1505
Trucks	ATC = 175 x .365 x 6.169 x 4.2	= 1655
	ATC = 175 x .365 x 4.318 x 6.4	= 1765
	Total ATC	=10892

Existing Road (1994) (₱1000)

Cars/Vans	ATC = 745 x .365 x 2.437 x 4.4 =	2783
	ATC = 745 x .365 x 1.799 x 6.4 =	3131
Jeepneys	ATC = 235 x .365 x 1.623 x 4.2 =	585
	ATC = 235 x .365 x 1.202 x 6.4 =	660
Buses	ATC = 175 x .365 x 7.551 x 4.2 =	2026
	ATC = 175 x .365 x 5.369 x 6.4 =	2195
Trucks	ATC = 220 x .365 x 6.169 x 4.2 =	2080
	ATC = 220 x .365 x 4.318 x 6.4 =	2219
	Total ATC =	15679

Existing Road (1999) (₱1000)

Cars/Vans	ATC = 1145 x .365 x 2.437 x 4.2 =	4278
	ATC = 1145 x .365 x 1.799 x 6.4 =	4812
Jeepneys	ATC = 340 x .365 x 1.623 x 4.2 =	846
	ATC = 340 x .365 x 1.202 x 6.4 =	955
Buses	ATC = 250 x .365 x 7.551 x 4.2 =	2894
	ATC = 250 x .365 x 5.369 x 6.4 =	3135
Trucks	ATC = 295 x .365 x 4.318 x 6.4 =	2976
	Total ATC =	22686

Existing Road (2003) (₱1000)

Cars/Vans	ATC = 1715 x .365 x 2.437 x 4.2 =	6407
	ATC = 1715 x .365 x 1.799 x 6.4 =	7207
Jeepneys	ATC = 445 x .365 x 1.623 x 4.2 =	1107
	ATC = 445 x .365 x 1.202 x 6.4 =	1250
Buses	ATC = 325 x .365 x 7.551 x 4.2 =	3762
	ATC = 325 x .365 x 5.369 x 6.4 =	4076
Trucks	ATC = 375 x .365 x 6.169 x 4.2 =	3546
	ATC = 375 x .365 x 4.318 x 6.4 =	3782
	Total ATC =	31137

Impr. Level 1 (1984) (₱1000)

Cars/Vans	ATC = 305 x .365 x 1.258 x 10.6 =	1484
Jeepneys	ATC = 110 x .365 x 0.806 x 10.6 =	343
Buses	ATC = 85 x .365 x 3.483 x 10.6 =	1145
Trucks	ATC = 130 x .365 x 2.763 x 10.6 =	1389
	Total ATC =	4361

Impr. Level 1 (1989) (₱1000)

Cars/Vans	ATC = 470 x .365 x 1.258 x 10.6 =	2288
Jeepneys	ATC = 160 x .365 x 0.806 x 10.6 =	499
Buses	ATC = 120 x .365 x 3.483 x 10.6 =	1617
Trucks	ATC = 175 x .365 x 2.763 x 10.6 =	1871
	Total ATC =	6275

Impr. Level 1 (1994) (₱1000)

Cars/Vans	ATC = 745 x .365 x 1.258 x 10.6 =	3626
Jeepneys	ATC = 235 x .365 x 0.806 x 10.6 =	733
Buses	ATC = 175 x .365 x 3.483 x 10.6 =	2358
Trucks	ATC = 220 x .365 x 2.763 x 10.6 =	2352
	Total ATC =	9069

Impr. Level 1 (1999) (₱1000)

Cars/Vans	ATC = 1145 x .365 x 1.258 x 10.6 =	5573
Jeepneys	ATC = 340 x .365 x 0.806 x 10.6 =	1060
Buses	ATC = 250 x .365 x 3.483 x 10.6 =	3369
Trucks	ATC = 295 x .365 x 2.763 x 10.6 =	3154
	Total ATC =	13156

Impr. Level 1 (2003) (₱1000)

Cars/Vans	ATC = 1715 x .365 x 1.258 x 10.6 =	8347
Jeepneys	ATC = 445 x .365 x 0.806 x 10.6 =	1388
Buses	ATC = 325 x .365 x 3.483 x 10.6 =	4380
Trucks	ATC = 375 x .365 x 2.763 x 10.6 =	4009
	Total ATC =	18124

Summarize the results of the traffic costs calculations in the following table and interpolate intermediate values to complete the 20-year stream of actual traffic costs.

D Normal Traffic Benefits

Traffic benefits are calculated as the difference between the total actual traffic costs on the project road under the existing conditions and the total actual traffic costs on the improved road . Users of these guidelines should find it more convenient to calculate directly on the table for summary of actual traffic costs.

Summary of Actual Traffic Costs and Benefits By Year and Improvement Level in 1000₱

Name of Project Road : _____

Section No. 1 Length of Section : 10.6 Km.

Year	Actual Traffic Costs			Traffic Cost Savings
	Existing	Impr. Level 1	Impr. Level 2	
1984	7594	4361		3233
1985	8162	4690		3472
1986	8773	5044		3729
1987	9429	5425		4004
1988	10134	5835		4299
1989	10892	6275		4617
1990	11715	6755		4960
1991	12601	7271		5330
1992	13553	7827		5726
1993	14577	8425		6152
1994	15679	9069		6610
1995	16881	9769		7112
1996	18176	10524		7652
1997	19570	11337		8233
1998	21070	12213		8857
1999	22686	13156		9530
2000	24555	14253		10302
2001	26578	15441		11137
2002	28767	16729		12038
2003	31137	18224		13013

Present Value Jan. 1,1984	8 %	59,447
	15%	34,133
	20%	25,116
	30%	15,970

E Maintenance Savings

The Planning and Project Development Office (PPDO) of the former MPH developed a maintenance cost system based on cost experience from actual maintenance operations in several regions of good maintenance standards, and has used the system in all PPDO feasibility studies. For purposes of these guidelines, the above maintenance system should be used. The economic cost per kilometer, in June 1981 prices, are listed hereunder.

Economic Maintenance Costs Per km.
For a 6.10 m Carriageway Including Shoulders
June 1981 Prices

		Routine/Year	Periodic
PCC	Improved	₱ 6510	
	Existing	₱12210	
AC	Improved	₱ 8140	₱186,375[1]
	Existing	₱13025	
DBST	Improved	₱11400	₱ 48,840[2]
	Existing	₱14650	

Gravel Surfacing, Improved and Existing

Vehicles AADT		
0 - 50	₱ 6510	₱61050[3]
51 -100	₱ 8140	
101 -150	₱ 9760	
151 -200	₱12200	
201 -250	₱14650	
251 -300	₱17900	
301 -350	₱21160	
351 -400	₱24410	
401 and above	₱27660	

1) 4 centimeters overlay, every 10th year
2) Resurfacing every 5 years for improved roads
3) 10 centimeters thickness of regraveling every 5 years for improved roads.

Calculation Procedures (Use the following format)

Road Inventory Information: (See Section 5.3)

Economic Maintenance Costs and Savings

June 1981 Prices

1000₱

	Existing		Impr. Lev. 1		Savings		
Year	Routine	Periodic	Routine	Periodic	Rout.	Per.	Total
1984	210	-	86		124	-	124
1985	210	-	86		124	-	124
1986	210	-	86		124	-	124
1987	210	-	86		124	-	124
1988	210	-	86		124	-	124
1989	210	-	86		124	-	124
1990	210	-	86		124	-	124
1991	210	-	86		124	-	124
1992	210	-	86		124	-	124
1993	210	-	86	1975	124	(1975)	(1851)
1994	210	-	86		124	-	124
1995	210	-	86		124	-	124
1996	210	-	86		124	-	124
1997	210	-	86		124	-	124
1998	210	-	86		124	-	124
1999	210	-	86		124	-	124
2000	210	-	86		124	-	124
2001	210	-	86		124	-	124
2002	210	-	86		124	-	124
2003	210	-	86	1975	124	(1975)	(1851)

1984 Maintenance Costs (₱1000)

Existing: RMC[1] = 4.2 x 27.660 + 6.4 x 14.650=210

PMC[2] = None

Impr. Lev.1: RMC = 10.6 x 8.140= 86

PMC = None

Present Value		
	8%	-126
January 1, 1984	15%	179
	20%	256
	30%	294

Notes: 1) Routine Maintenance Cost

2) Periodic Maintenance Cost

1989 Maintenance Costs (₱1000)

Existing: RMC= 4.2 x 27.660+ 6.4 x 14.650+ 210

PMC= None

Impr. Lev.1: RMC= 10.6 x 8.140 = 86

PMC= None

1994 Maintenance Costs (₱1000)

Existing: RMC= 4.2 x 27.660 + 6.4 x 14.650 = 210

PMC= None

Impr. Lev.1: RMC= 10.6 x 8.140= 86

PMC= 10.6 x 186.357 = 1975

Etc.

F Benefit /Cost Analyses

F-1 Discounting

For discounted cash flow analyses, it is imperative that the prices of all elements in both cost and benefits sides are referred to or are prevailing in a single point in time to iron out the distortion which may be brought about by different inflation rates, in the results. In like manner, all costs and benefits should be translated into their "present value" through the process of discounting to account for the opportunity cost of capital. In feasibility studies of road improvement projects, it is common practice to take the first day of the project/year opening as the datum or reference point of all future values. Assume all costs during a year to be incurred at midyear and the benefits to accure also at midyear. Included in the guidelines are present value or discount factors at 4 different rates: 8, 15, 20 and 30 percent per annum for ready use of the district and regional planning staff.

F-2 Discounted Economic Costs

Project implementation may take two or more years, from detailed engineering and acquisition of road right-of-way to actual construction. The feasibility study should include an assessment of the yearly budgetary requirement during implementation stage, If, for example, the Investment schedule below represents the entries in Section 4.3-Estimated Cash Flow, to convert the values into their January 1, 1984 values would mean "compounding" the 1981 figure by $2^{1/2}$ years, and the 1983 figure by $^{1}/_{2}$ year.

Present Value (Discount) Factors

Year	8%	15%	20%	30%
- 4	1.3091	1.6310	1.8929	2.5050
- 3	1.2122	1.4182	1.5774	1.9269
- 2	1.1224	1.2332	1.3145	1.4822
- 1	1.0392	1.0724	1.0954	1.1402
1	0.9623	0.9325	0.9129	0.8771
2	0.8910	0.8109	0.7607	0.6747
3	0.8250	0.7051	0.6339	0.5190
4	0.7639	0.6131	0.5283	0.3992
5	0.7073	0.5332	0.4402	0.3071
6	0.6549	0.4636	0.3669	0.2362
7	0.6064	0.4031	0.3057	0.1817
8	0.5615	0.3506	0.2548	0.1398
9	0.5199	0.3048	0.2123	0.1075
10	0.4814	0.2651	0.1769	0.0827
11	0.4457	0.2305	0.1474	0.0636
12	0.4127	0.2004	0.1229	0.0489
13	0.3821	0.1743	0.1024	0.0376
14	0.3538	0.1516	0.0853	0.0290
15	0.3276	0.1318	0.0711	0.0223
16	0.3033	0.1146	0.0593	0.0171
17	0.2809	0.0997	0.0494	0.0132
18	0.2601	0.0867	0.0411	0.0101
19	0.2408	0.0754	0.0343	0.0078
20	0.2230	0.0655	0.0286	0.0060

Investment Schedule
Economic Values, 1000₱

1981	1982	1983	Total Present Value Jan. 1, 1984 8%	15%	20%	30%
238	3886	3886	8688	9297	9740	10649

F-3 Summary of Costs and Benefits

Summarize all discounted costs and benefits in the suggested format prior to calculation of economic feasibility indicators.

Summary of Costs and Benefit
(₱1000)

Section No. 1 Name of Road: _____

Length: 10.6 km. Impr. Level: 6.10m asphalt Concrete
+ 2 x 2.0 m. Gravel Shoulders

Discount Rate (5 p.a.)	Benefits: Traffic Cost Savings	Benefits: Maintenance Cost Savings	Benefits: Total	Project Costs
8	59447	(-126)	59321	8688
15	34133	179	34312	9297
20	25116	256	25372	9740
30	15970	294	16264	10649

Internal Rate of Return and Sensitivity Analysis

Sect. No.	Impr. Level	Internal Rate of Return (Percent): Best Estimate	+ 20% on Cost - 20% on Normal Traffic Benefits	- 20% on Cost + 20% on Normal Traffic Benefits
1	I	37.6	31.0	43.5

FYB/C @ 15%	Net Present Worth (Million ₱) 8%	15%	20%	30%	B/C 8%	15%	20%	30%
34.8	50.6	25.0	15.6	5.6	6.83	3.69	2.60	1.53

Calculation Procedures

i) Benefit/Cost Ratio (B/C)

$$B/C = \frac{\text{Total Discounted Benefits}}{\text{Total Discounted Costs}}$$ (at the same discount rate)

ii) Net Present Worth (NPW)

NPW = Total Discounted Benefits - Total Discounted Costs (at the same discount rate)

iii) First Year Benefit/Cost Ratio (FYB/C)

FYB/C = Total Traffic Cost Benefits at the opening year ÷ Total Discounted Cost at 15 percent discount rate

iv) Internal Rate of Return (IRR)

IRR = discount rate at which the total discounted benefits will be equal to total discounted costs.

Using the traditional algebraic methods, the solution for the IRR would be a very tedious cut-and-try process. Therefore, the more convenient and easy graphical method should be used. See Figure 1 below. At the intersection points of the benefit and cost curves, the benefits are equal to the costs, and it must follow that at the intersection point, the discount rate is the IRR.

The revised Internal Rate of Return (IRR), B/C ratio, NPW and FYB/C (%) are shown below after imputing the income redistribution benefit, assuming that our sample project is located in a low income region.

	Benefits				
Discount Rate (% p.a.)	Traffic Cost Savings	Maintenance Cost Savings	Income Redis. Benefit	Total	Project Cost
	thousand pesos				
8	59447	(-126)	20169	79490	8688
15	34133	179	11666	45978	9297
20	25116	256	8626	33998	9740
30	15970	294	5530	21794	10649

B/C Ratio				Net Present Worth (₱ M)				FYB/C (%)
8%	15%	20%	30%	8%	15%	20%	30%	15%
9.15	4.94	3.49	2.05	70.8	36.7	24.2	11.1	46.6

Internal Rate of Return (%) and Sensitivity Analysis

Sect. No.	Impr. Level	Best Estimate	+ 20% on Cost - 20% on Normal Traffic Benefits	- 20% on Cost + 20% on Normal Traffic Benefits
1	I	42.0	36.8	47.4

REPUBLIC OF THE PHILIPPINES
MINISTRY OF PUBLIC WORKS AND HIGHWAYS
OFFICE OF THE MINISTER
MANILA

ATTACHMENT D

PROJECT MERIT RATING
Illustrated Example

Name of Project : Improvement of San Jose - Sta. Maria Road Km. 100.200 - 160.500

Location : Province/Region

	Value	Weighted Merit Points
1. Economic Feasibility		
a. First Year Benefit-Cost Ratio (for pre-feasibility evaluation)	N. A.	
OR		
b. Benefit-Cost Ratio (for feasibility evaluation)	1.82	42.30
2. Social Development/Service		
Degree of Contribution of Project to Improvement of Health/Education/ Safety & Security	High	25.00
3. Induced Employment		
Degree of Employment Generating Capacity	Medium	10.00
	TOTAL	77.30